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| APPLICATION NO.         | FILING DATE | FIRST NAMED INVENTOR | ATTORNEY DOCKET NO. | CONFIRMATION NO. |
|-------------------------|-------------|----------------------|---------------------|------------------|
| 10/551,372              | 08/02/2006  | Yoichi Matsubara     | Y-228 (NUBIC10494)  | 3142             |
| 802 7590 07/29/2010     |             |                      |                     |                  |
| PATENTTM.US             |             |                      |                     |                  |
| P. O. BOX 82788         |             |                      |                     |                  |
| PORTLAND, OR 97282-0788 |             |                      |                     |                  |
| EXAMINER                |             |                      |                     |                  |
| PETTTTT, JOHN F         |             |                      |                     |                  |
| ART UNIT                |             | PAPER NUMBER         |                     |                  |
| 3744                    |             |                      |                     |                  |
| MAIL DATE               |             | DELIVERY MODE        |                     |                  |
| 07/20/2010              |             | PAPER                |                     |                  |

**Please find below and/or attached an Office communication concerning this application or proceeding.**

The time period for reply, if any, is set in the attached communication.

# Office Action Summary

## Application No.

10/551,372

## Applicant(s)

MATSUBARA ET AL.

## Examiner

John F. Pettitt

## Art Unit

3744

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --  
Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

## Status

- 1) ☒ Responsive to communication(s) filed on 27 April 2010.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

## Disposition of Claims

- 4) ☒ Claim(s) 1-8 is/are pending in the application.
- 4a) Of the above claim(s) 1,2 and 4-6 is/are withdrawn from consideration.
- 5) ☐ Claim(s) \_\_\_\_\_ is/are allowed.
- 6) ☒ Claim(s) 3, 7-8 is/are rejected.
- 7) ☐ Claim(s) \_\_\_\_\_ is/are objected to.
- 8) ☐ Claim(s) \_\_\_\_\_ are subject to restriction and/or election requirement.

## Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☐ The drawing(s) filed on \_\_\_\_\_ is/are: a) ☐ accepted or b) ☐ objected to by the Examiner.  
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).  
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

## Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some \* c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
  2. ☐ Certified copies of the priority documents have been received in Application No. \_\_\_\_\_.
  3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

\* See the attached detailed Office action for a list of the certified copies not received.

## Attachment(s)

- 1) ☒ Notice of References Cited (PTO-892)
- 2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
- 3) ☐ Information Disclosure Statement(s) (PTO/SB/22)
- 4) ☐ Interview Summary (PTO-413)  
Paper No(s)/Mail Date: \_\_\_\_\_
- 5) ☐ Notice of Informal Patent Application
- 6) ☐ Other: \_\_\_\_\_
- Paper No(s)/Mail Date: \_\_\_\_\_

**DETAILED ACTION**

***Claim Rejections - 35 USC § 102***

The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

Claim 3 is rejected under 35 U.S.C. 102(b) as being anticipated by Swift et al. (US 4953366) hereafter Swift. Swift teaches a pulse-tube refrigerator (PTR, 52) comprising a pulse tube (78), a cool storage unit (72) connected to a low-temperature side (near 76) of said pulse tube (78), a vibration generator (42) connected to a high-temperature side (near 74) of said cool storage unit (72), and a reservoir (86) with an orifice (84) connected to a high-temperature side (near 82) of said pulse tube (78), wherein said vibration generator (42) is a heat-driven pressure-wave generator (column 7, line 37) which operates as an oscillator for generating a traveling acoustic wave by causing self-excited vibration with resonance (structure capable of operating with a traveling wave) comprising a heat-driven tube (46 and tube of cross-sections of figures 2A-2B in combination with 56, 58, 62, hereafter simply referred to as 46, 56, 58, 62) and two resonators (51 of both TAD's - column 7, line 20) connected to an inlet port of said heat-driven tube (22, 16, 14, 18), wherein said heat-driven tube (46) consists of a heat-storage unit (56), a heating heat exchanger (58), a radiation heat exchanger (62), and a work-transmission tube (46).

***Claim Rejections - 35 USC § 103***

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

The factual inquiries set forth in *Graham v. John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

Claims 3, 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swift in view of Matsubara, Pressure wave generator for a pulse tube cooler", *Cryocoolers* 12, 2003, p343-349. Swift teaches most of the claim limitations including a pulse-tube refrigerator (PTR, 12) comprising a pulse tube (32), a cool storage unit (24) connected to a low-temperature side (near 28) of said pulse tube (32), a vibration generator (10) connected to a high-temperature side (near 26, 34) of said cool storage unit (24), and a reservoir (38) with an orifice (36) connected to the high-temperature side (near 26, 34) of said pulse tube (32), wherein said vibration generator (10) is a heat-driven pressure-wave generator (column 2, line 63; 30-40) comprising a heat-driven tube (22, 16, 14, 18) and a resonator (19; column 4, line 24; column 5, lines 20-24) connected to a inlet port of said heat-driven tube (22, 16, 14, 18), wherein said heat-driven tube (22, 16, 14,

18) consists of a heat-storage unit (14), a heating heat exchanger (16), a radiation heat exchanger (18), and a work-transmission tube (22).

Swift does not teach that the resonator comprises two resonators symmetrically connected. Matsubara, however, teaches that a thermoacoustic wave generator may be improved by providing two symmetric resonators. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to replace the resonator (19) of Swift with the two symmetric resonators for the purpose of providing a more efficient thermoacoustic wave generator. It is noted that the modification also permits operation of as an oscillator for generating a traveling wave by causing self-excited vibration with resonance.

Claims 3, 7-8 are rejected under 35 U.S.C. 103(a) as being unpatentable over Swift in view of Corey (US 6578364) and further in view of Corey (US 2002/0178736) or Morinigo et al (US 5354185) or Wu (US 5412951). Swift teaches most of the claim limitations including a pulse-tube refrigerator (PTR, 12) comprising a pulse tube (32), a cool storage unit (24) connected to a low-temperature side (near 28) of said pulse tube (32), a vibration generator (10) connected to a high-temperature side (near 26, 34) of said cool storage unit (24), and a reservoir (38) with an orifice (36) connected to the high-temperature side (near 26, 34) of said pulse tube (32), wherein said vibration generator (10) is a heat-driven pressure-wave generator (column 2, line 63; 30-40) comprising a heat-driven tube (22, 16, 14, 18) and a resonator (19; column 4, line 24; column 5, lines 20-24) connected to a inlet port of said heat-driven tube (22, 16, 14, 18),

wherein said heat-driven tube (22, 16, 14, 18) consists of a heat-storage unit (14), a heating heat exchanger (16), a radiation heat exchanger (18), and a work-transmission tube (22).

Swift does not teach that the resonator is a piston in cylinder oscillator. Corey (364), however, teaches that a thermoacoustic wave generator may be improved by replacing a fluid resonator with a solid piston resonator (see 116, column 6, lines 29-47) since such saves length of the dimension of the device and eliminates high velocity flow losses. Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to replace the resonator (19) of Swift with a solid piston resonator for the purpose of providing a more efficient thermoacoustic wave generator. It is noted that the modification also permits operation of as an oscillator for generating a traveling wave by causing self-excited vibration with resonance.

Swift and Corey (364) do not explicitly teach that the resonator comprises two resonators symmetrically connected. However, it is known piston cylinder devices exhibit some reflected vibrations, and that such residue vibrations may be reduced by employing symmetric pistons as taught by any one of Corey (736) - (column 3, lines 40-45; showing that a mechanical pressure wave generator for a pulse tube cooler employs dual opposed pistons), Morinigo (column 7, lines 40-67 - showing that back to back pistons are known to provide vibration cancellation), or Wu (column 1, line 60 - dual opposed pistons known for reducing vibration). Therefore, it would have been obvious to one of ordinary skill in the art, at the time the invention was made, to modify the

resonator of Swift and Corey to employ dual opposed piston resonators for the purpose of reducing residual vibrations as taught by Corey (736), Morinigo, or Wu.

***Priority***

Applicant cannot rely upon the foreign priority papers to overcome the rejection of Swift in view of Matsubara because a translation of said papers has not been made of record in accordance with 37 CFR 1.55. See MPEP § 201.15.

***Response to Arguments***

Applicant's arguments with respect to claim 3 have been considered but are moot in view of the new ground(s) of rejection. It is noted that Swift (366) anticipates claim 3 as indicated above. The two resonators (51 of both TAD's) are discussed in column 7, line 20.

***Conclusion***

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to John F. Pettitt whose telephone number is 571-272-0771. The examiner can normally be reached on M-F 8a-4p.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Cheryl Tyler or Frantz Jules can be reached on 571-272-4834 or 571-272-6681. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/John F Pettitt /  
Examiner, Art Unit 3744

/Cheryl J. Tyler/  
Supervisory Patent Examiner, Art  
Unit 3744

JFP III  
July 15, 2010